

Applicant: Thomas KLEINBECK et al.  
Docket No. R.306719  
Preliminary Amdt.

**AMENDMENTS TO THE SPECIFICATION:**

Page 1, please add the following new paragraphs before paragraph [0001]:

[0000.2] CROSS-REFERENCE TO RELATED APPLICATIONS

[0000.4] This application is a 35 USC 371 application of PCT/DE 2004/001303  
filed on June 22, 2004.

[0000.6] BACKGROUND OF THE INVENTION

Please replace paragraph [0001] with the following amended paragraph:

[0001] ~~Prior Art~~ **Field of the Invention**

Please replace paragraph [0002] with the following amended paragraph:

[0002] The invention is ~~based on a~~ **directed to an improved** high-pressure pump for a fuel injection system of an internal combustion engine as generically defined by the preamble to claim 1.

Please add the following new paragraph after paragraph [0002]:

[0002.5] Description of the Prior Art

Please replace paragraph [0003] with the following amended paragraph:

[0003] One ~~[[such]]~~ high-pressure pump ~~[[is]]~~ known from German Patent Disclosure DE 198 44 272 A1~~[[.]]~~ ~~This high-pressure pump has~~ **employs** a rotationally driven drive shaft, which has a shaft portion embodied eccentrically to the axis of rotation of the drive shaft. A polygonal ring is rotatably supported on the eccentric shaft portion. The high-pressure pump has at least one pump element, with at least one pump piston driven in a reciprocating motion at least indirectly by the drive shaft via the ring. The ring, on its circumference, has flat faces,

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Docket No. R.306719  
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corresponding in number to the pump elements, on which faces the pump pistons rest at least indirectly, for instance via a tappet. In operation of the high-pressure pump, heavy loads on the ring and the pump pistons or tappets, especially high pressures per unit of surface area, occur. Moreover, sliding motions can occur between the ring and the pump pistons or tappets. Lubricating the contact region between the ring and the pump pistons or tappets is done by means of the fuel present in the interior of the high-pressure pump housing. Particularly at high fuel temperatures, however, the lubrication provided by the fuel is no longer sufficient, so that severe wear of the ring and/or the pump pistons or tappets occurs, which finally can cause failure of the high-pressure pump.

Page 2, please replace paragraph [0004] with the following amended paragraph:

[0004] ~~Advantages of the Invention~~

#### **SUMMARY AND ADVANTAGES OF THE INVENTION**

Please replace paragraph [0005] with the following amended paragraph:

[0005] The high-pressure pump according to the invention~~[,]] having the characteristics of claim 1~~~~[,]]~~ has the advantage over the prior art that because of the friction-reducing paint coating of the ring, adequate wear resistance of the contact region between the ring and at least indirectly the at least one pump piston is assured.

Please replace paragraph [0006] with the following amended paragraph:

[0006] ~~In the dependent claims,~~ **Advantageous** features and refinements of the high-pressure pump of the invention are ~~recited~~ **disclosed**. The combination of a nitrocarburized surface layer

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Docket No. R.306719  
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and the coating of friction-reducing paint applied to it ~~in accordance with claim 3~~ makes especially good wear resistance possible. The coating of friction-reducing paint provides a running-in aid at the beginning of operation of the high- pressure pump, so that the microtopographies of the surfaces of the ring and at least indirectly of the pump piston can adapt to one another. Moreover, as a result of the pressure that occurs in operation of the high-pressure pump between the ring and at least indirectly the pump piston, friction-reducing paint ingredients are pressed into the large-pore seam of the nitrocarburized surface layer of the ring. This creates lubricant reservoirs of friction-reducing paint ingredients, from which, when the high-pressure pump is running hot at high fuel temperatures, solid lubricant particles are exported continuously, thereby preventing inadequate lubrication.

Please replace paragraph [0007] with the following amended paragraph:

[0007] ~~Drawing~~ **BRIEF DESCRIPTION OF THE DRAWINGS**

Please replace paragraph [0008] with the following amended paragraph:

[0008] One exemplary embodiment of the invention is ~~shown in the drawing and described in further detail in the ensuing description. Fig. 1 shows a fuel injection system of an internal combustion engine with a high-pressure pump, and Fig. 2 shows the high-pressure pump in a cross-section taken along the line H-H in Fig. 1~~**described herein below, in conjunction with the drawings, in which:**

Please add the following new paragraphs after paragraph [0008]:

[0008.2] Fig. 1 shows a fuel injection system of an internal combustion engine with a high-pressure pump, and

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Docket No. R.306719  
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[0008.4] Fig. 2 shows the high-pressure pump in a cross section taken along the line II-II in Fig. 1.

Page 3, please replace paragraph [0009] with the following amended paragraph:

[0009] ~~Description of the Exemplary Embodiment~~

**DESCRIPTION OF THE PREFERRED EMBODIMENT**

Page 4, please replace paragraph [0012] with the following amended paragraph:

[0012] The pump piston 34 is kept with its piston base 50 in contact with the polygonal ring 28 directly by a prestressed spring 48 or via a tappet 52. Upon the rotary motion of the drive shaft 12, the polygonal ring 28 is not ~~moved~~ **rotated** with it but instead, because of the eccentric portion 26, executes a motion perpendicular to the axis of rotation 13 of the drive shaft 12, which causes the reciprocating motion of the pump piston 34. The polygonal ring 28, in its outer jacket, has flat face 29 for each pump element 32, on which face the piston base 50 or the tappet 52 rests. In the intake stroke of the pump piston 34, in which this piston moves radially inward, the pump work chamber 38 is filled with fuel through the fuel inlet conduit 40 with the inlet valve 42 open and the outlet valve 46 closed. In the pumping stroke of the pump piston 34, in which this piston moves radially outward, fuel under high pressure is fed by the pump piston 34 through the fuel outlet conduit 44 to ~~[[the]]~~ **a** reservoir ~~[[110]]~~ **,not shown,** with the outlet valve 46 open and the inlet valve 42 closed.

Applicant: Thomas KLEINBECK et al.  
Docket No. R.306719  
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Page 6, please add the following new paragraph after paragraph [0017]:

[0018] The foregoing relates to preferred exemplary embodiments of the invention, it being understood that other variants and embodiments thereof are possible within the spirit and scope of the invention, the latter being defined by the appended claims.